

# Pyraloidea



*Agriphila*

*Pyralis*

Chris Grinter, August 2017



CALIFORNIA  
ACADEMY OF  
SCIENCES

# Pyraloidea Basics

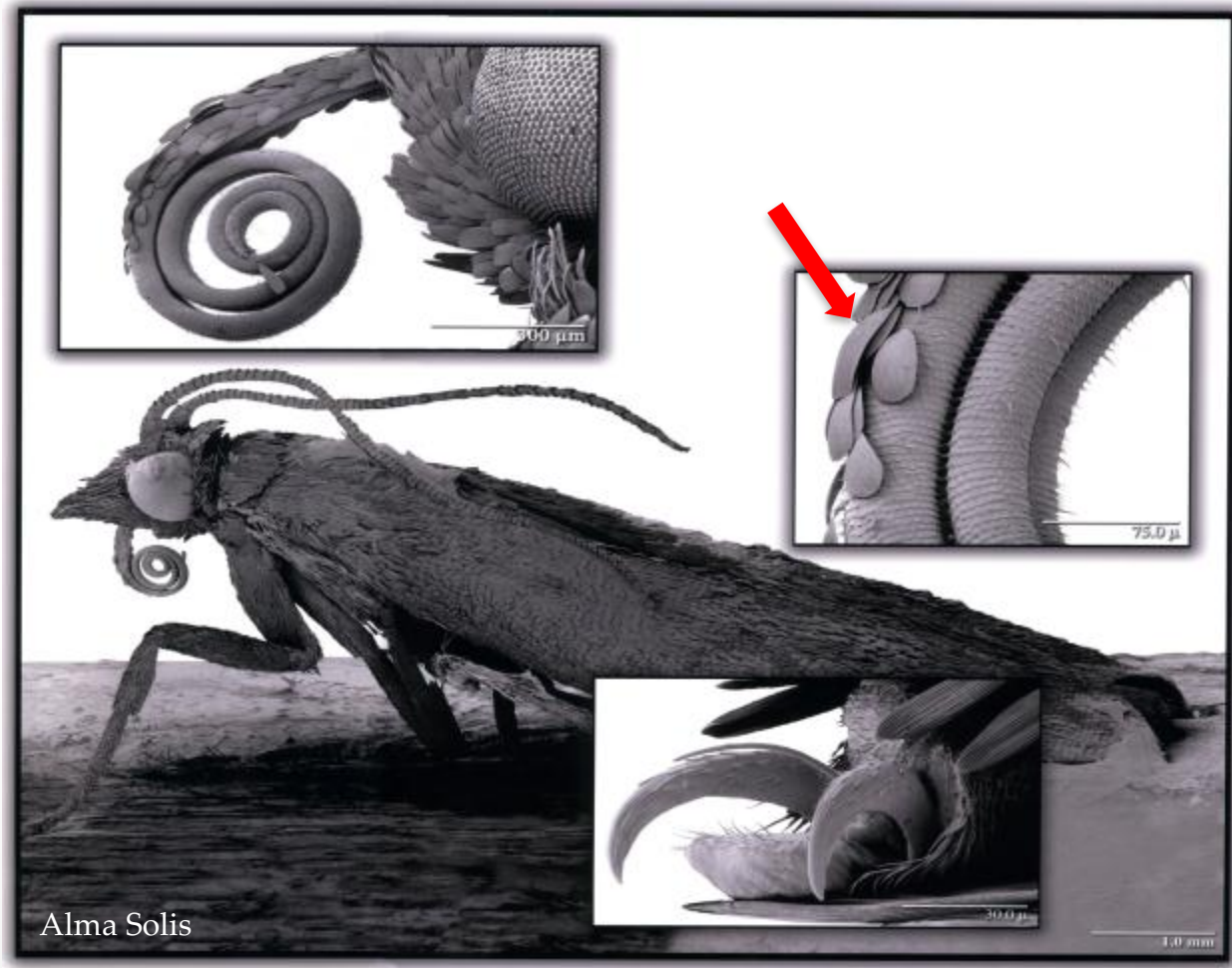
- Roughly 16,000 species worldwide with possibly 50% remaining to be described.
- Vast array of life histories, many of economic importance
- Concealed Feeders

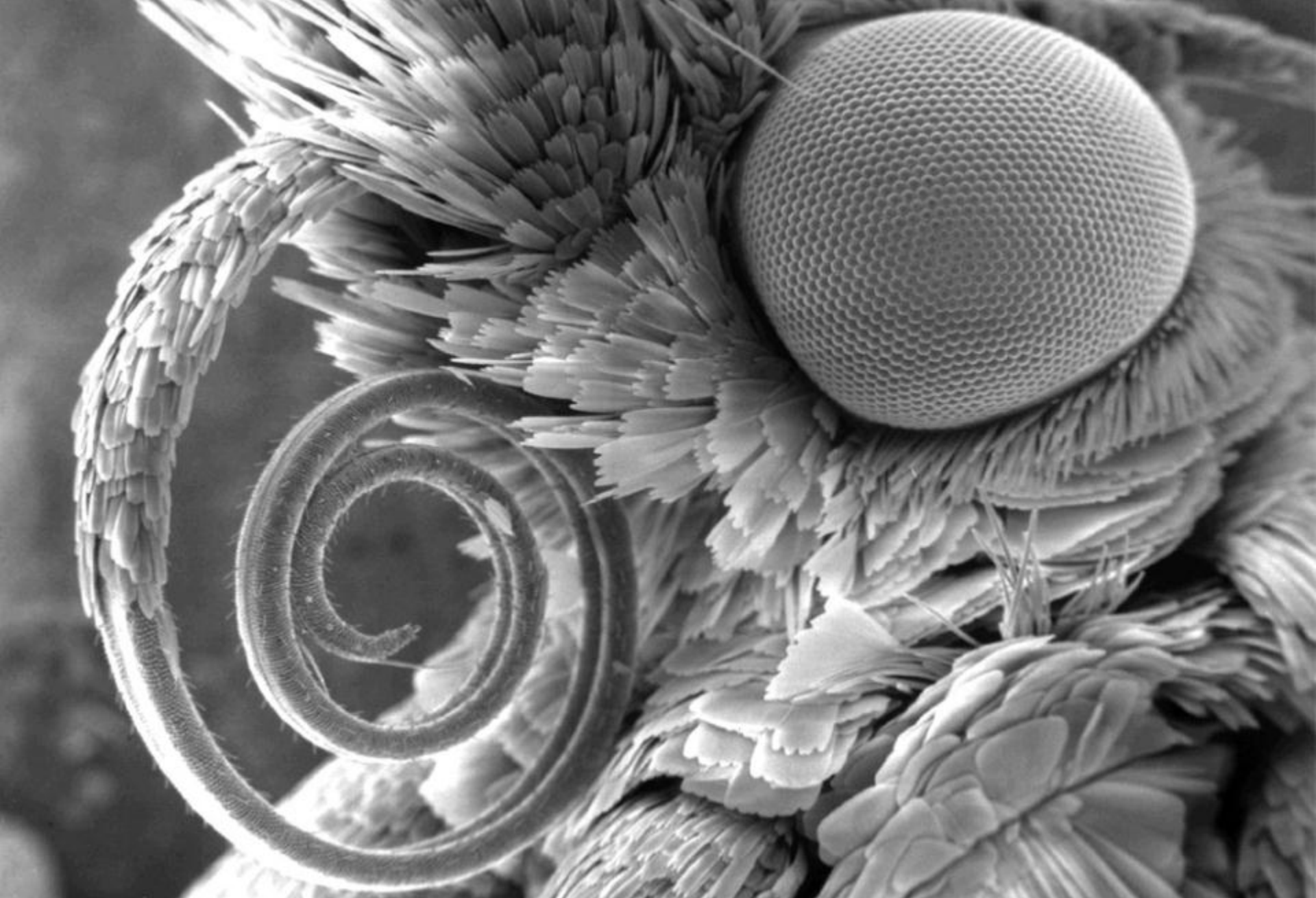
## Basic Characters

- 8 - 80mm wingspan
- Scaled proboscis
- Porrect or upturned labial palpi
- Paired tympanal organs on the abdomen

# Pyraloidea Characters

- Proboscis scaled basally



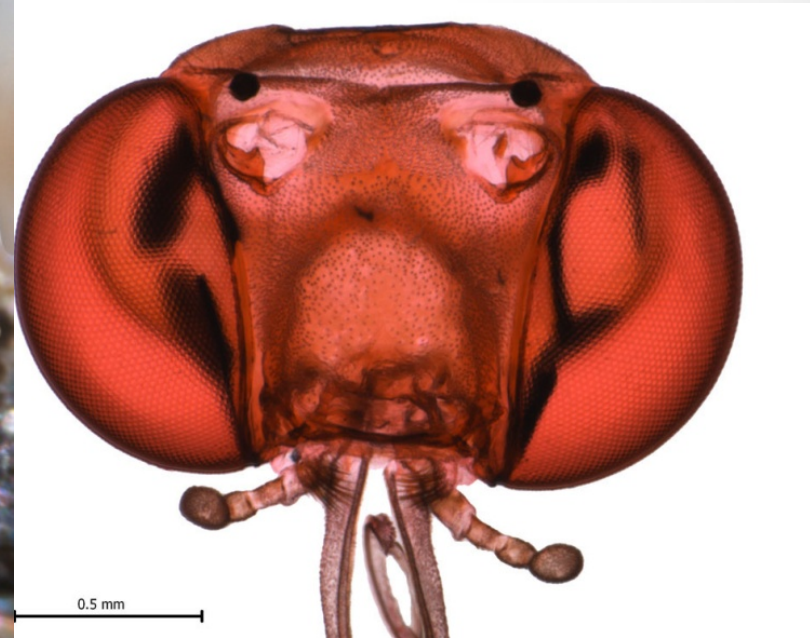
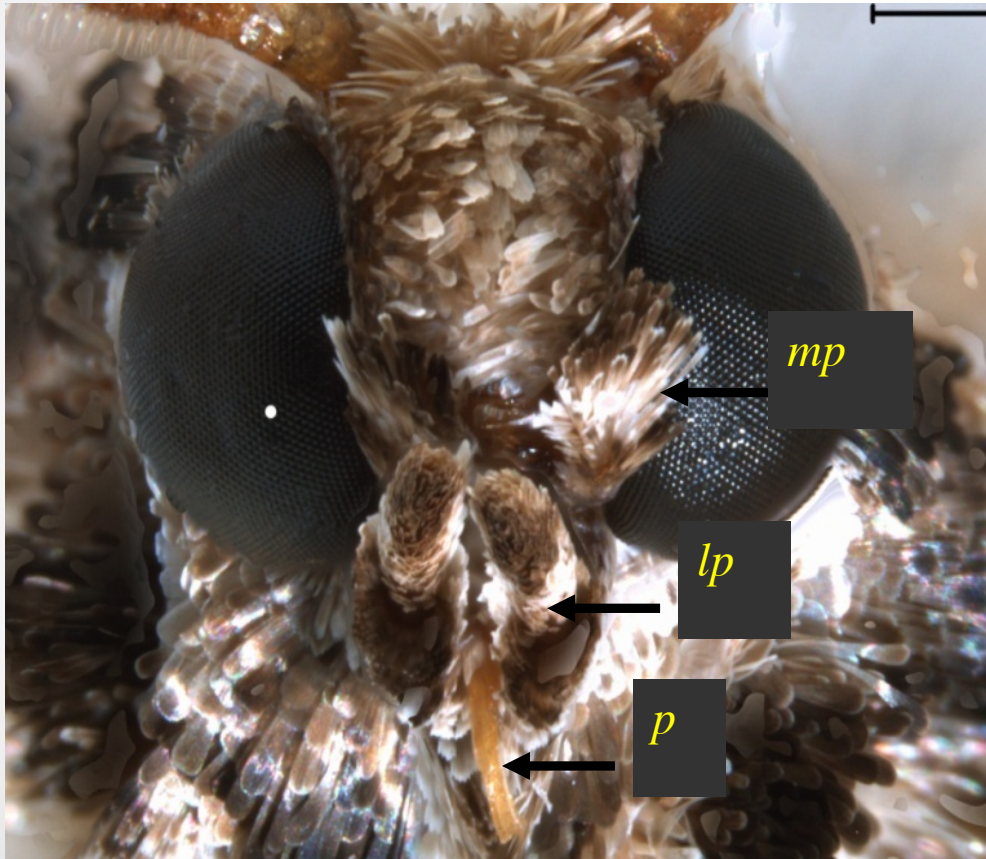


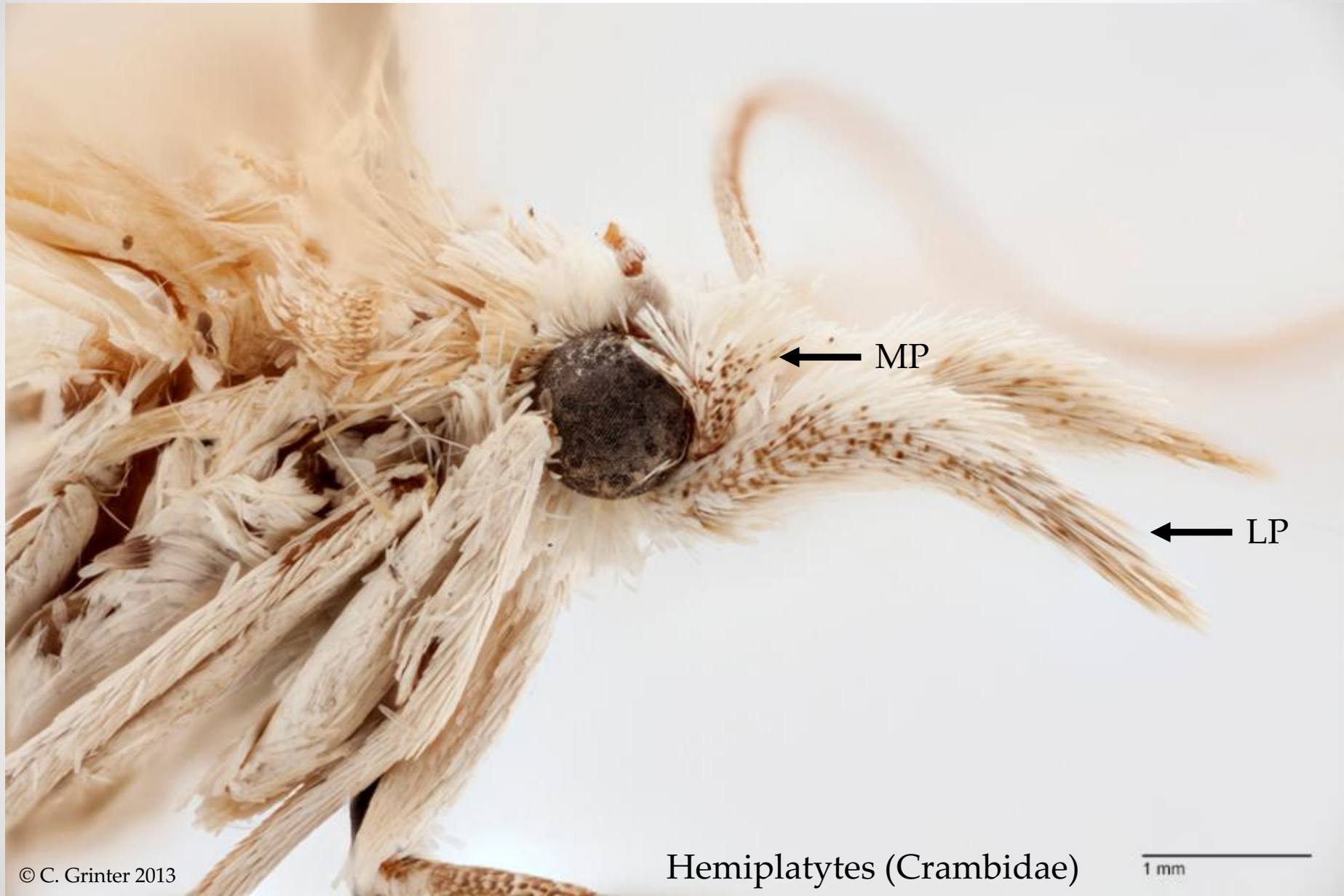
• Dartmouth Electron Microscope Facility/Dartmouth College •



# Pyraloidea Characters

- Maxillary palps present





© C. Grinter 2013

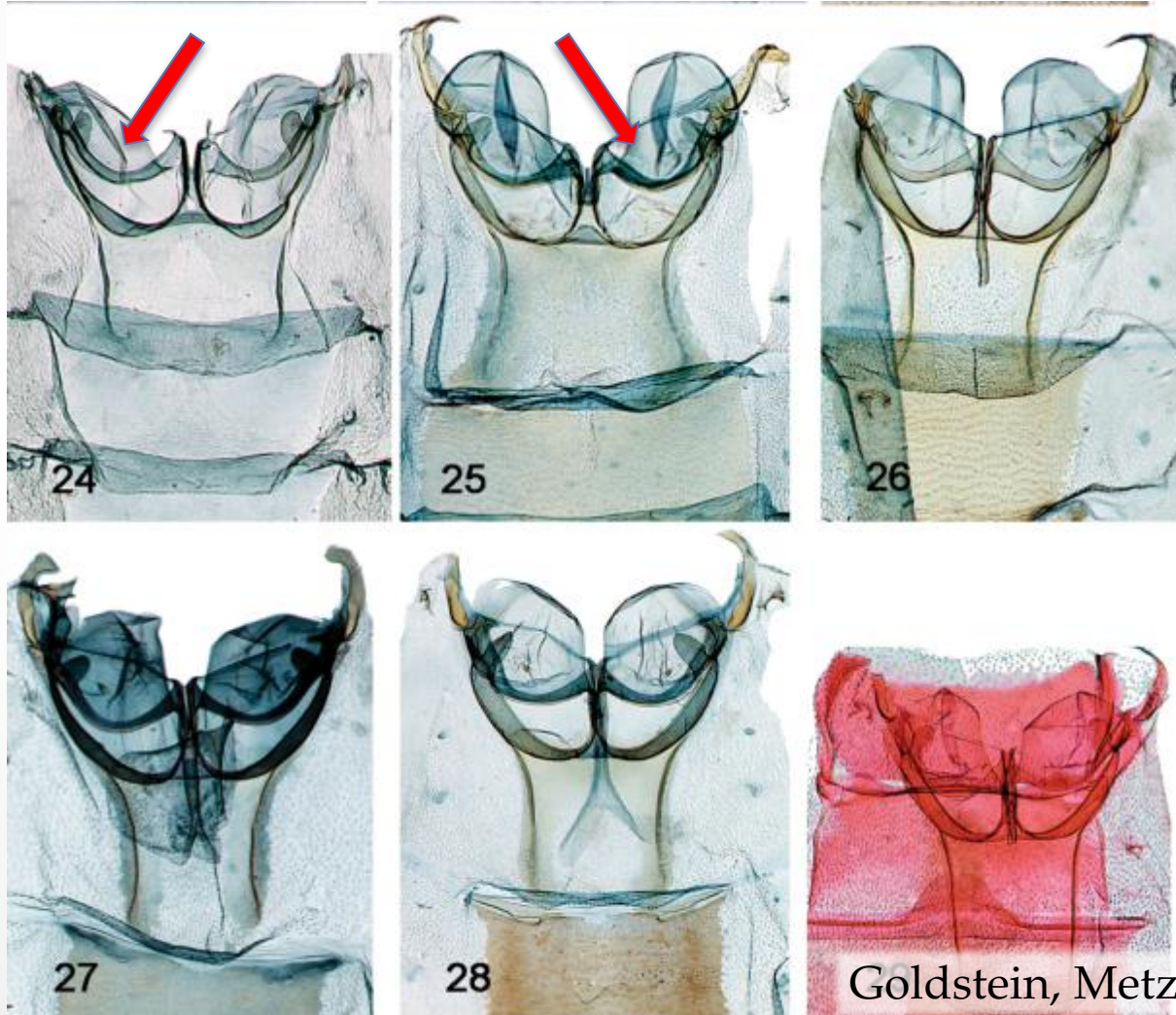
Hemiplatytes (Crambidae)

1 mm



# Pyraloidea Characters

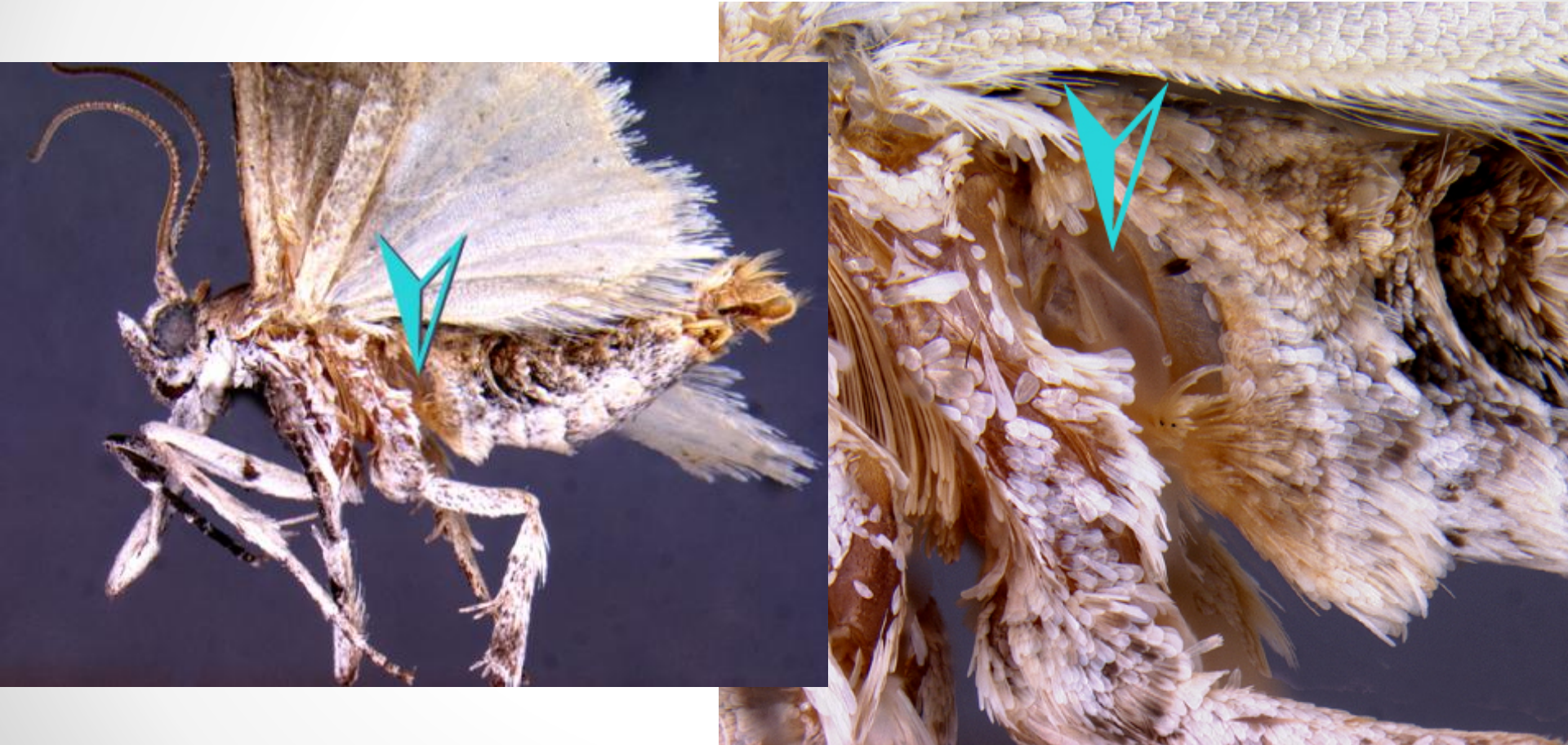
- Paired tympanal organs on the ventral surface of the 2<sup>nd</sup> abdominal segment.



Goldstein, Metz, Solis (2013)

# Pyraloidea Characters

- Paired tympanal organs on the ventral surface of the 2<sup>nd</sup> abdominal segment.





# Two Families

- **Pyralidae**

- forewing vein R5 stalked or fused with R3+4
- forewing without oval sclerotization costad of base of vein A1+2
- bullae tympani closed cephalad
- tympanum and conjunctivum in the same plane
- processus tympani absent
- praecinctorium absent
- accessory tympana absent
- male genitalia with uncus arms, (paired processes arising laterally from base of uncus)
- segment A8 of larvae almost always with sclerotized ring around base of SD1

- **Crambidae**

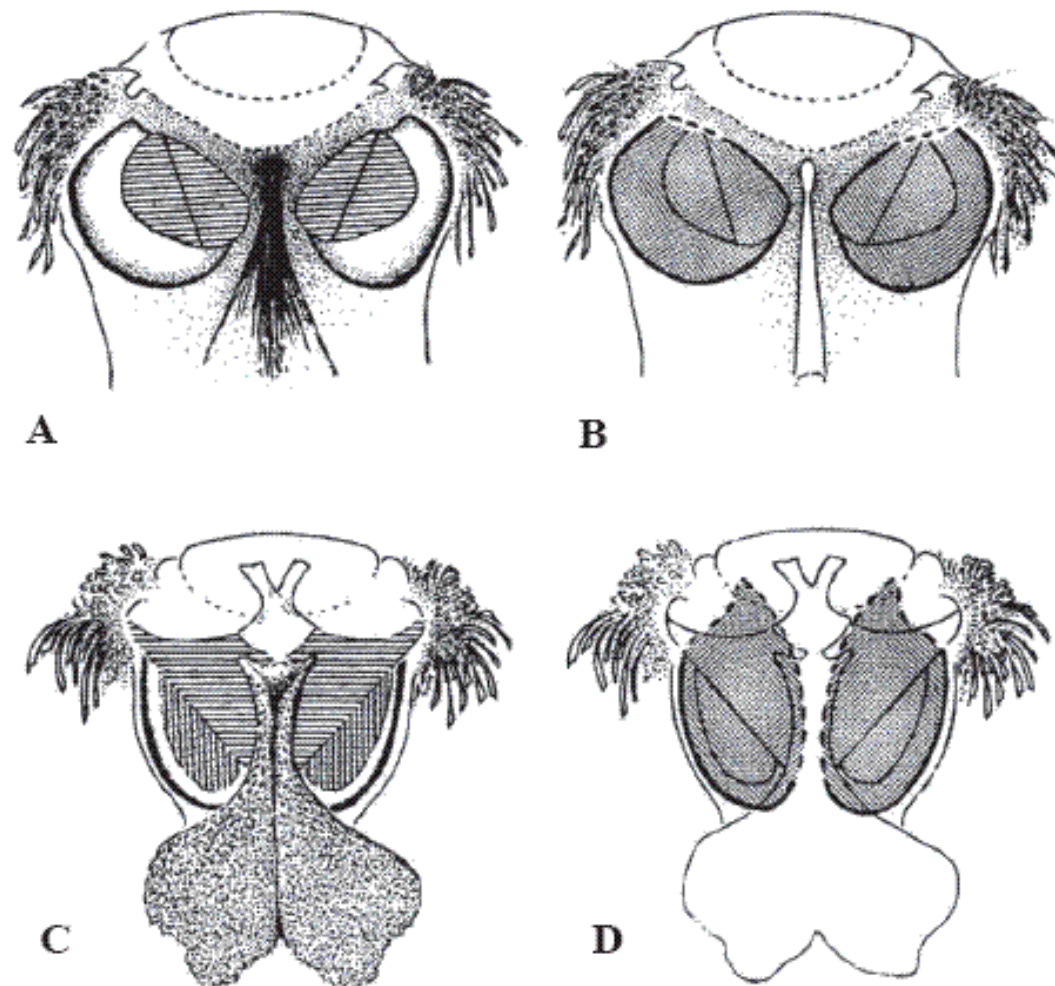
- forewing vein R5 free
- forewing with oval sclerotization costad of base of vein A1+2
- bullae tympani open cephalad
- tympanum and conjunctivum lying at a blunt angle
- processus tympani present
- praecinctorium present
- accessory tympana present caudally of metacoxae
- male genitalia without uncus arms
- segment A8 of larvae without sclerotized ring around base of SD1



# Pyralidae vs. Crambidae

- Differences in the tympani – closed vs. open



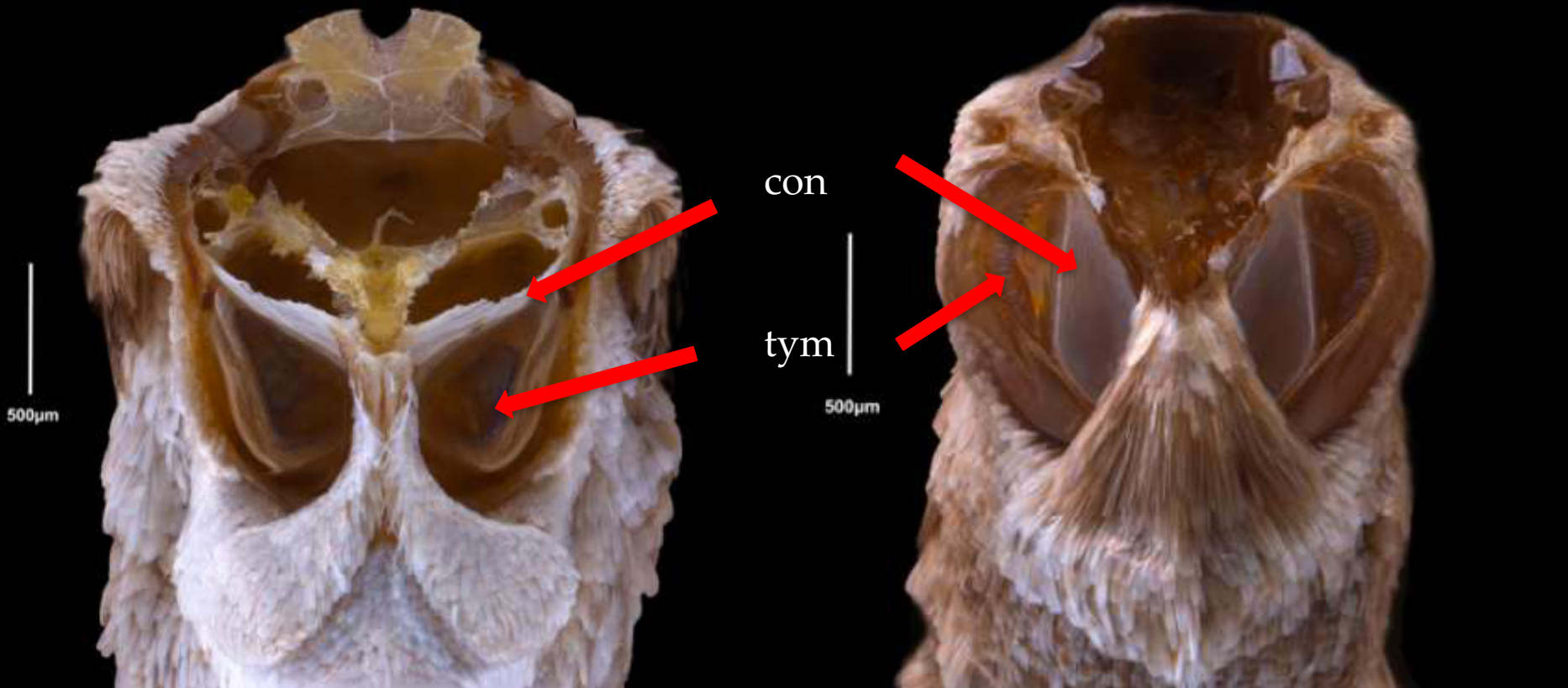


**Figure 2.** A. Pyralidae, praecinctorium absent, tympanum and conjunctiva in the same plane (line horizontal only). B. Pyralidae, praecinctorium absent, tympanal case closed medially and with a small, anterior aperture (bold dotted lines). C. Crambidae, praecinctorium present, tympanum and conjunctiva meeting at a distinct angle (lines horizontal and vertical). D. Crambidae, praecinctorium present, tympanal case open anteromedially (bold dotted lines). From Munroe and Solis (1999).

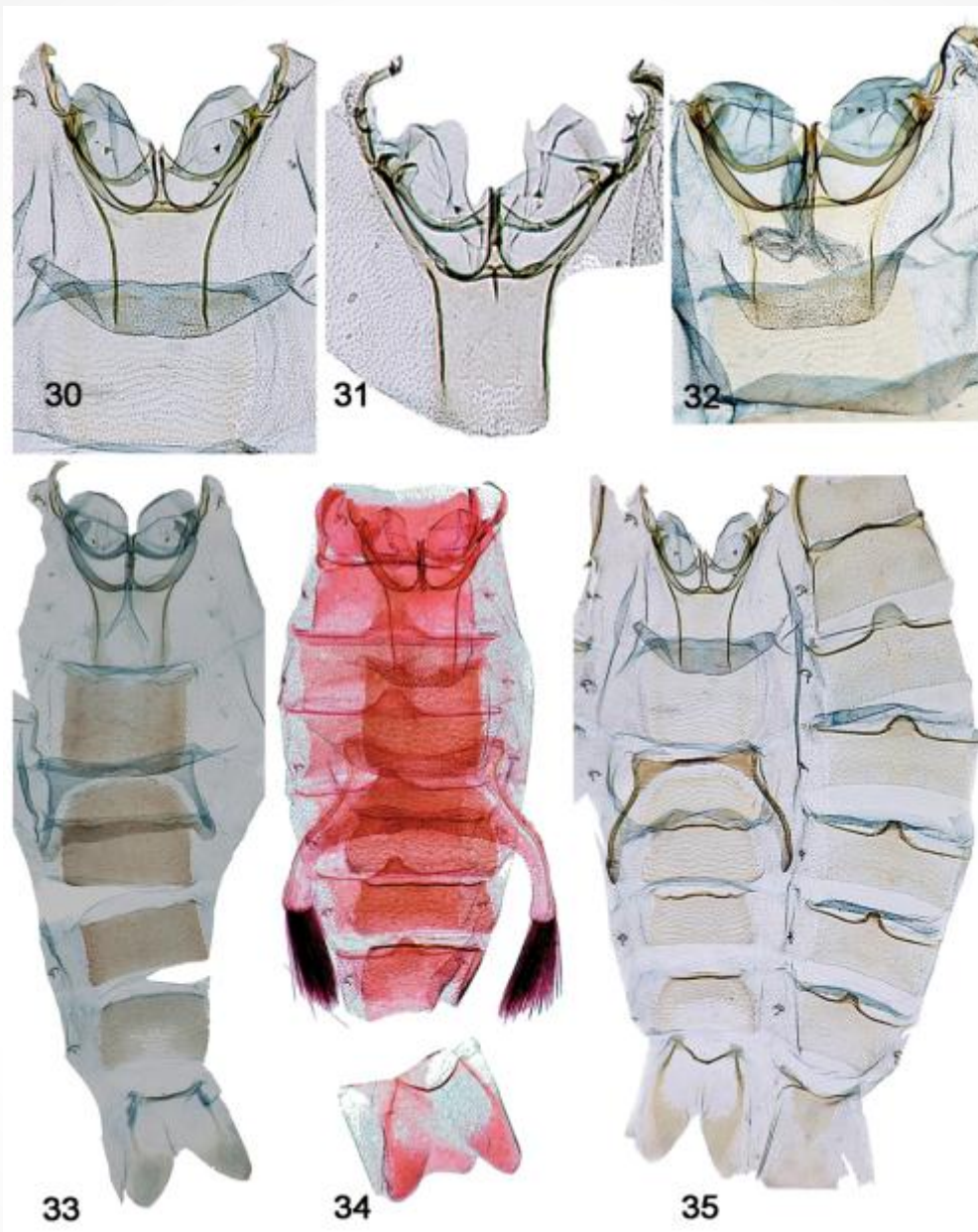
# Tympanum

Crambidae – conjunctiva  
at angle to tympanum

Pyralidae – conjunctiva in same  
plane as tympanum

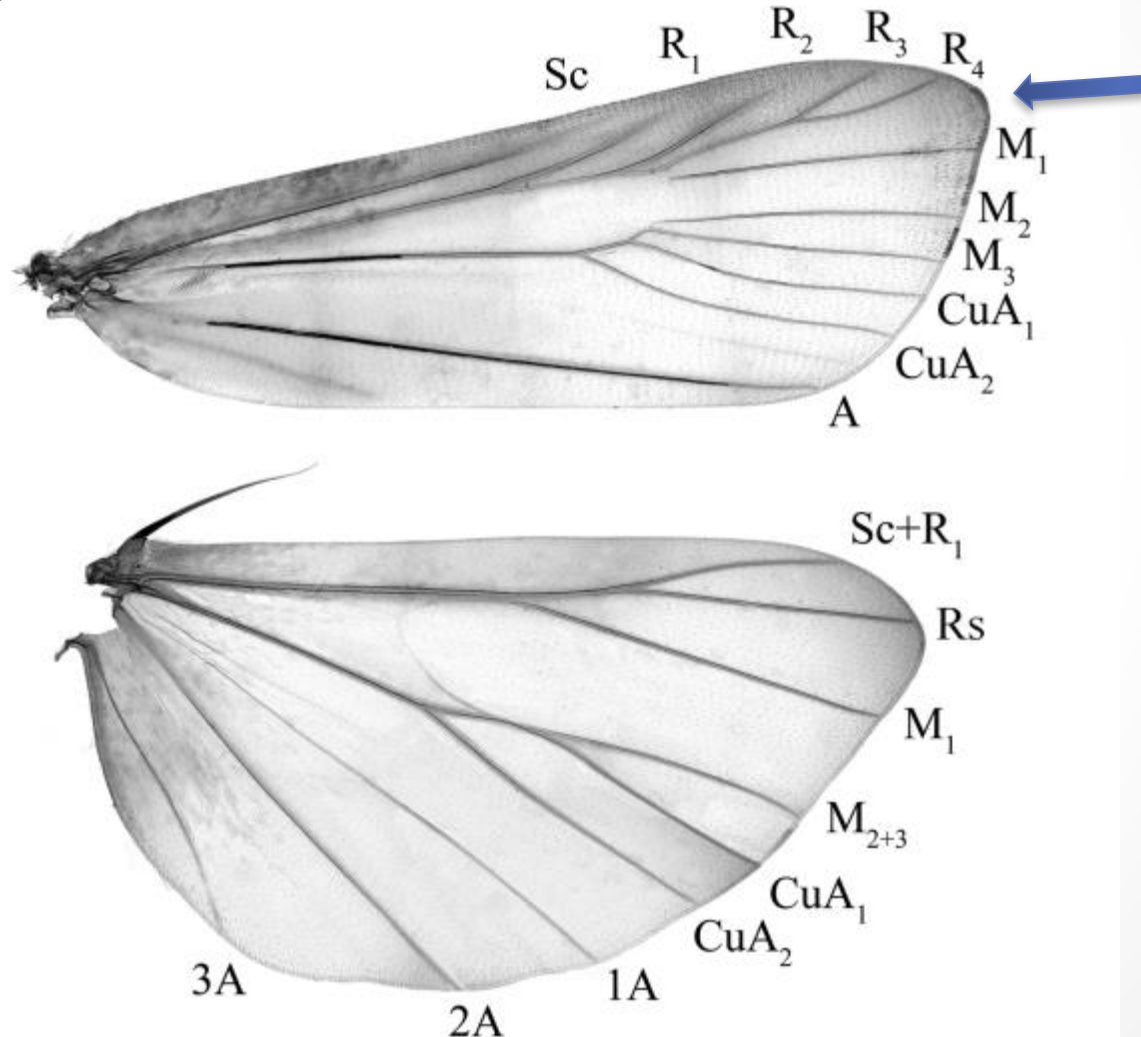






# Pyraloidea Characters

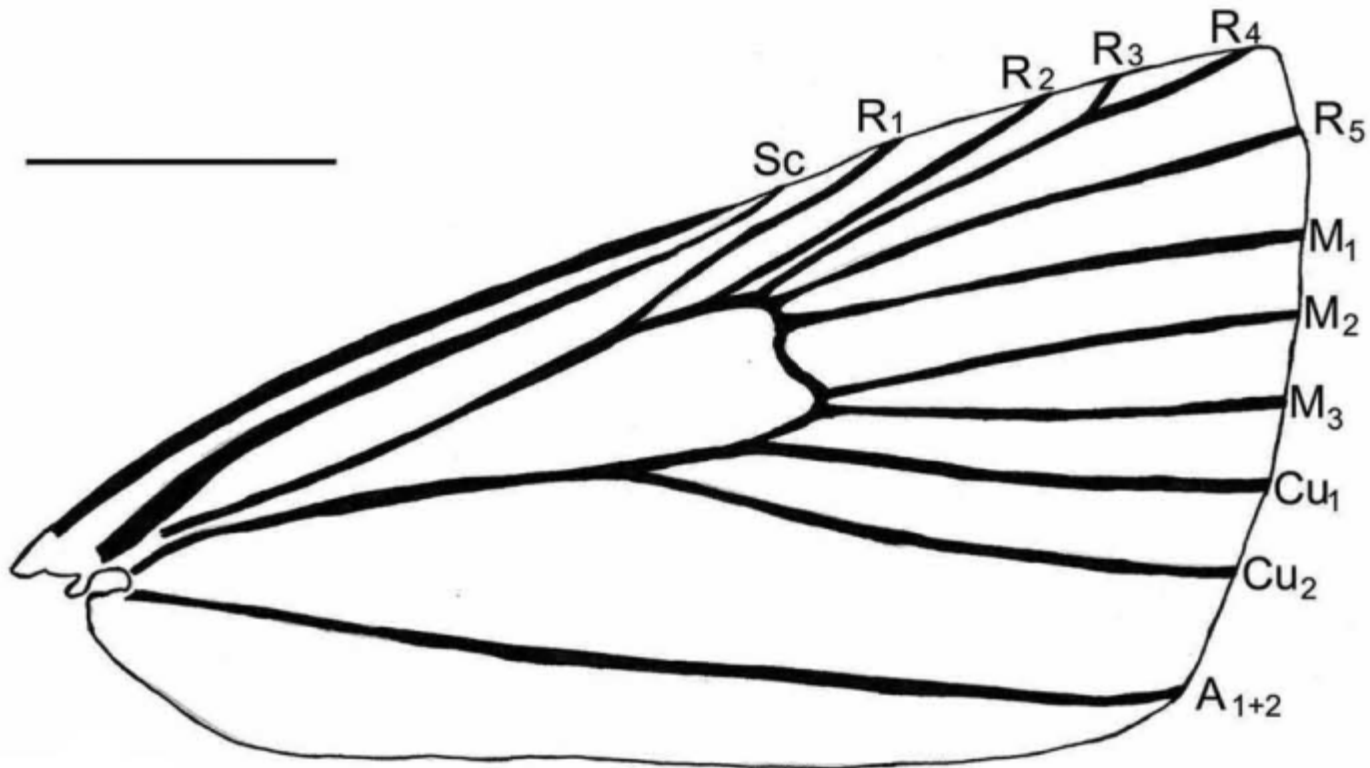
- Forewing R5 stalked or fused with R3+4 = Pyralidae





# Pyraloidea Characters

- Forewing R5 free = Crambidae



15

# Feeding in the Pyraloidea

- Biologies and behaviors known for relatively few species.
- Only 13 of 58 species of *Pyrausta* and three of 23 species of *Donacaula* with known hosts.
- Aquatic, Parasitic, Predatory, Fur, Crap, Sap, Wax, Fungus, Spines, Sloths, and of course leaves.
- Concealed feeders, usually very dull caterpillars.

# Concealed Feeding Strategies





# Feeding in the Pyraloidea



**Crambidae**



**Pyralidae**









# Predators on Scale Insects



*Laetilia  
coccidivora*



*Pulvinaria  
vitis*



*Eriococcus*

● Phycitinae

# Consume Wax in Bee and Wasp Nests



Jim Vargo

[homesteaderbees.blogspot](http://homesteaderbees.blogspot)



# Sloth Moths



Chrysauginae

# Aquatic Larvae



*Petrophila*



Mexico





# Biological Control

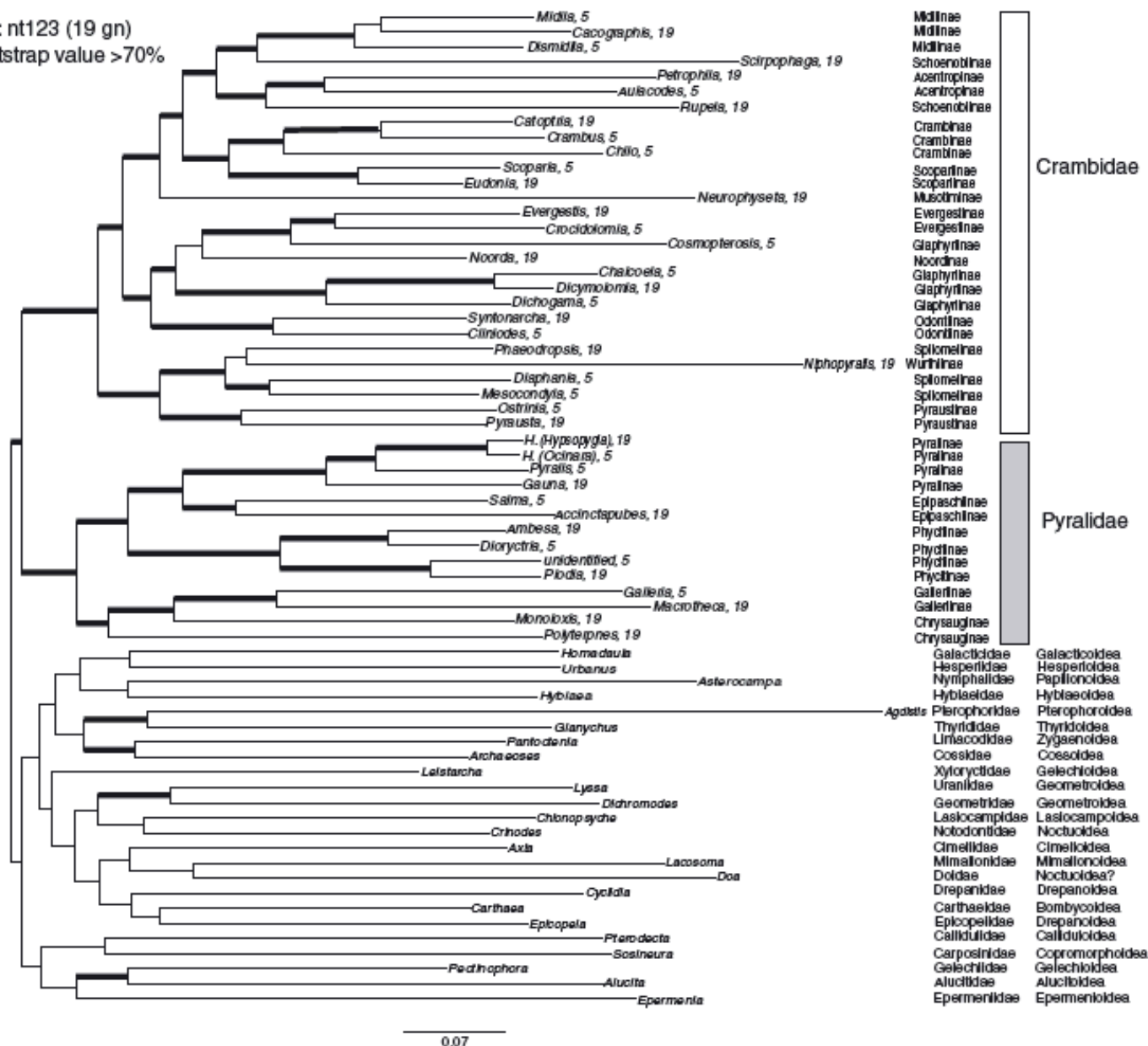


**Lygodium Defoliator Moth on Old World climbing fern – introduced in 2008 (Crambidae: Musotiminae)**

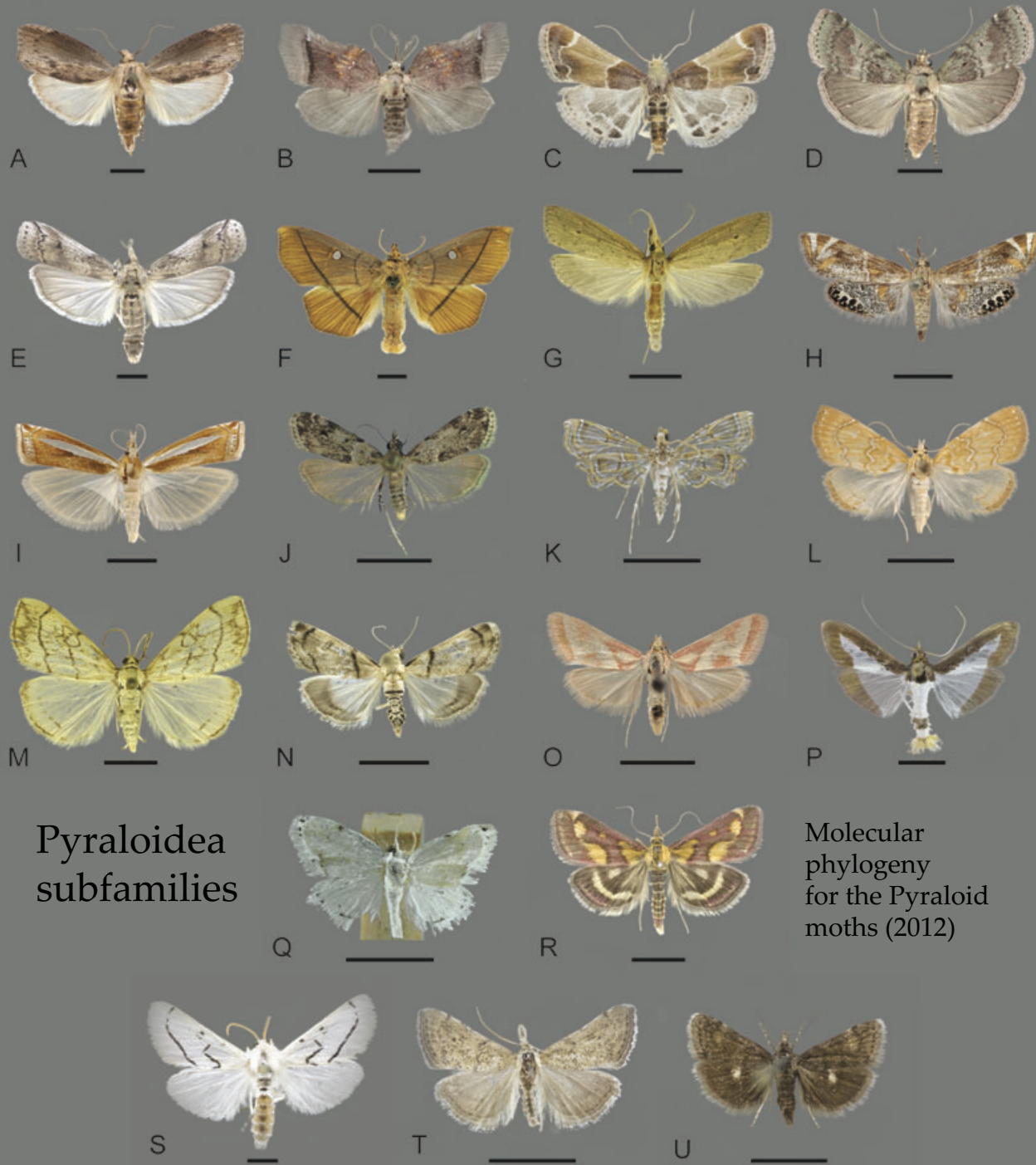


ML topology displayed: nt123 (19 gn)

— = at least one bootstrap value &gt;70%

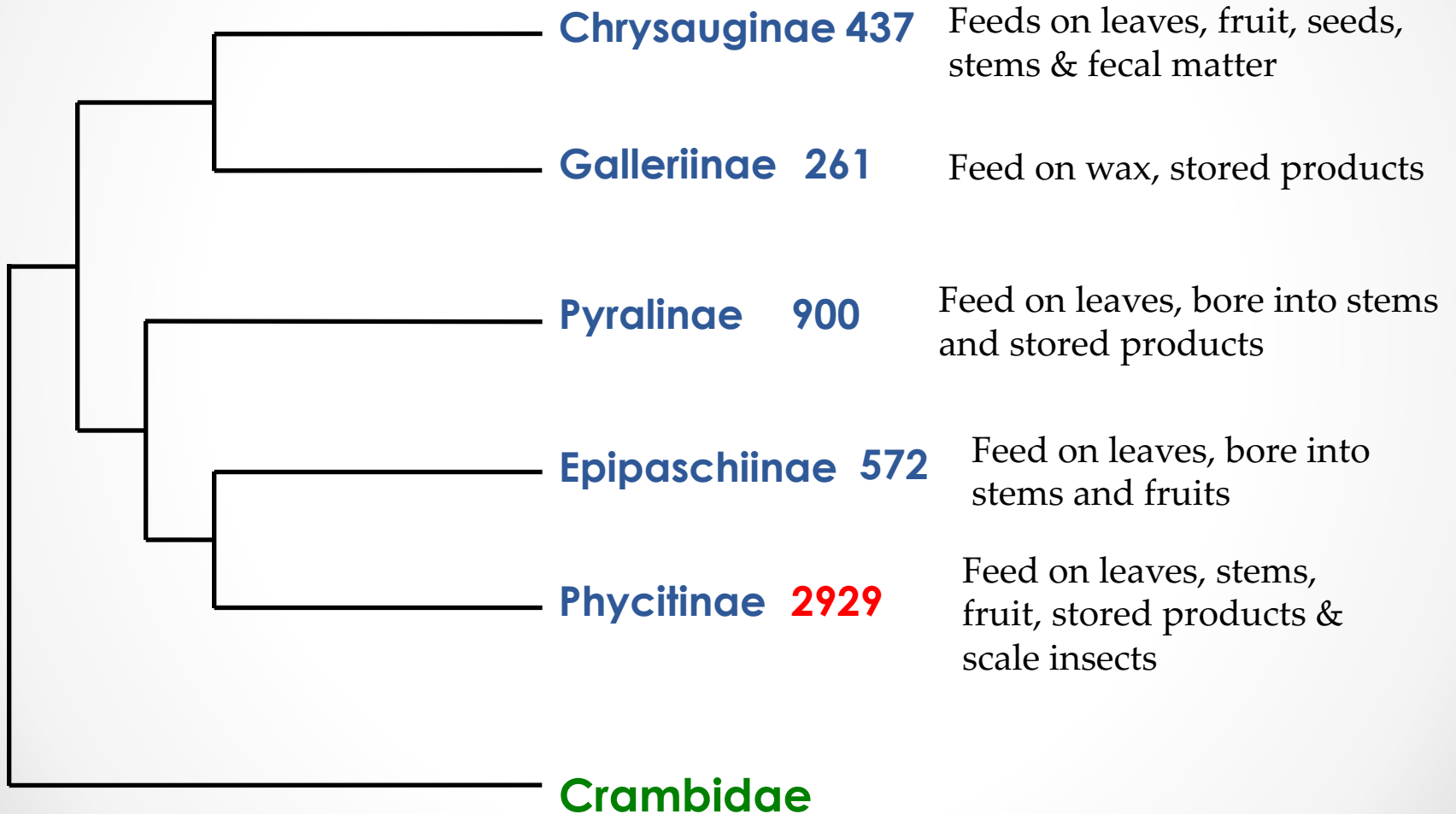


**Fig. 3.** Phylogram presentation of best tree obtained from 1000 GARLI searches under a GTR + gamma + I model for all nucleotides (unpartitioned). Thickened branches are supported by  $\geq 70\%$  bootstrap in at least one analysis (see Fig. 2).



# Pyrallidae

(Solis & Mitter, 1992)





# Chrysauginae



*Clydonopteron sacculana*



*Tosale oviplagalis*



Labial palpi

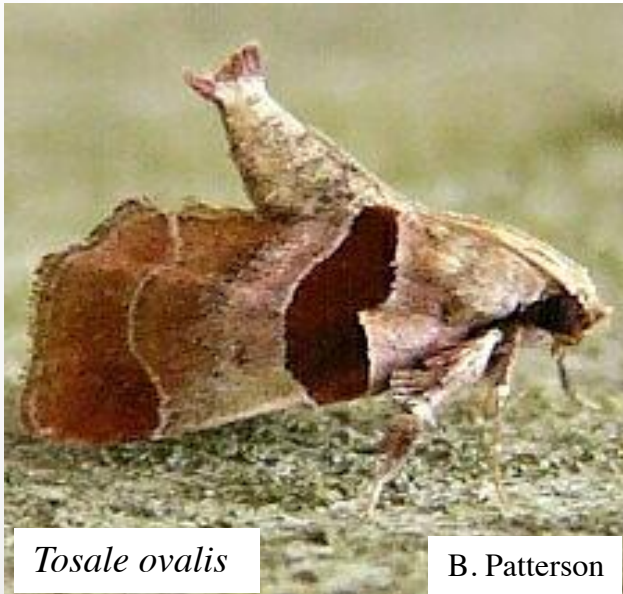


*Galasa nigrinodis*

All photos © Alama Solis

# Chrysauginae

- Mainly Neotropical
- Variety of larval feeding habits
- Tympana on wings of some species.
- *Clydonopteron*, *Galasa*



*Tosale ovalis*

B. Patterson



*Clydonopteron sacculana*

J. Armstrong



# Galleriinae – Wax Moths



*Achroia grisella*



Labial palpi



*Aphomia terrenella*



*Cacotherapia unipuncta*



# Pyrulinae



*Omphalocera munroei*



Labial palpi



*Aglossa caprealis*



*Herculia olinalis*

# Pyralinae

- Include stored product pests and species with scavenging larvae
- *Pyralis*, *Dolichomia*, *Aglossa*





# Epipaschiinae



*Epipaschia superatalis*



Labial palpi



Labial palpi



*Pococera expandens*



*Oneida lunulalis*



# Epipaschiinae

- Third segment of labial palpus upturned.
- Larvae: leaf rolling, tiers, miners.
- *Epipaschia*, *Pococera*



Macalla zelleri

J. Vargo



Pococera subcanalis

# Phycitinae

*Acrobasis vaccinii*.



Labial palpi



Labial palpi



*Acrobasis caryivorella*



*Euzophera ostricorella*



*Ephestia kuehniella*





# Phycitinae

- Largest subfamily
- Leaf-rollers, stem borers, conifer cones, some predaceous on Homoptera
- Many stored product pests
- H. H. Neunzig - MONA



© William Vann





# Phycitinae

- Cactus moths - native and exotic species



*Melitara dentata*

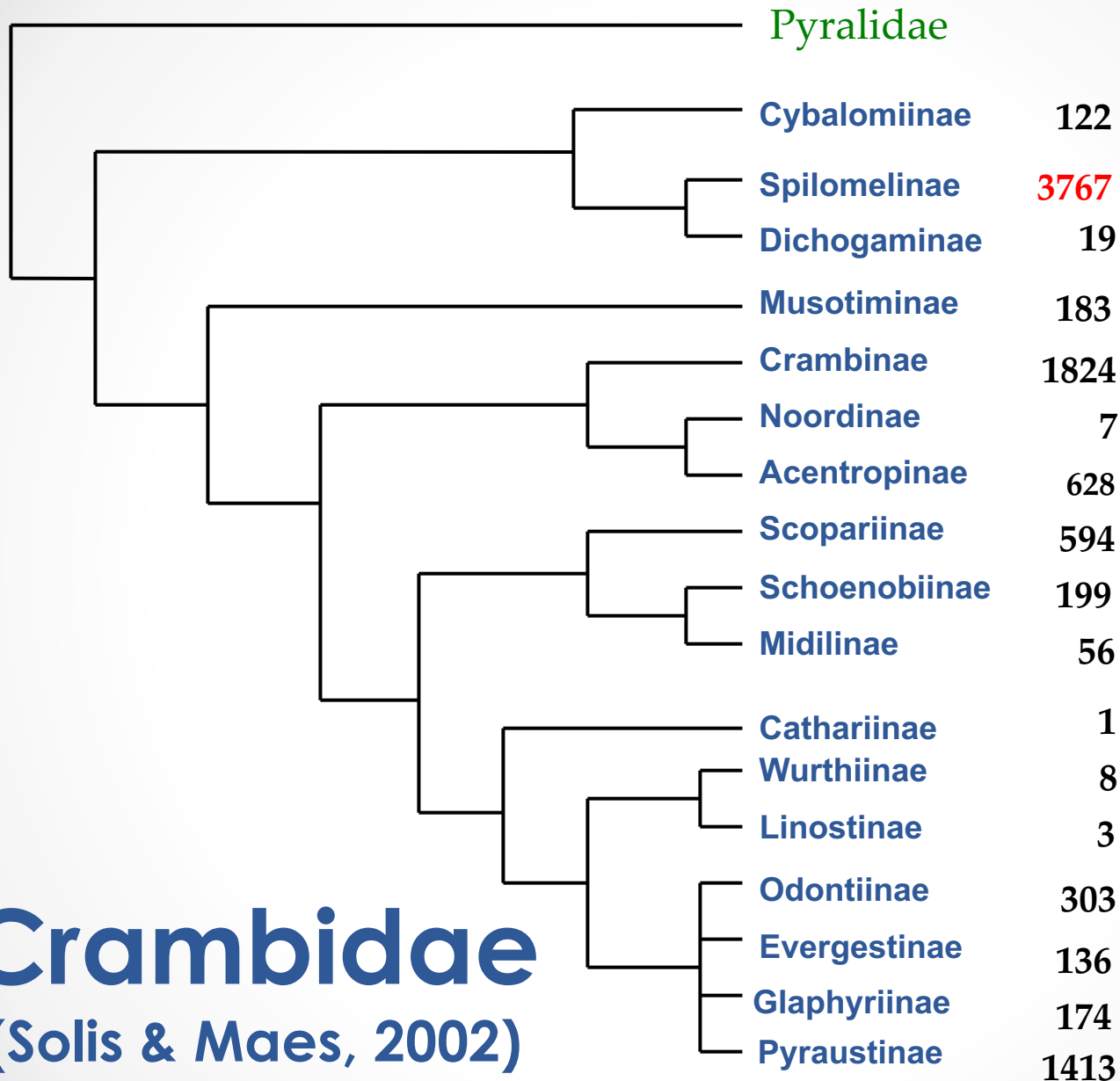


*Melitara* sp.



*Cactoblastis cactorum*





# Crambidae

(Solis & Maes, 2002)

# Crambidae

## Occur in the U.S.

Dichogaminae  
Evergestinae  
Glaphyriinae  
Musotiminae  
Schoenobiinae  
Odontiinae  
Scopariinae  
Acentropinae  
Pyraustinae  
Crambinae  
Spilomelinae

## Occur in the Western Hemisphere, but not in the U.S.

Linostinae  
Midilinae

## Do not occur in the Western Hemisphere

Cathariinae  
Noordinae  
Wurthiinae  
Cybalomiinae



Cybalomiinae\_labial palpi



Noordinae labial palpi



Cathariinae\_labial palpi



Wurthiinae\_labial palpi





Dichogaminae labial palpi



Odontiinae labial palpi



Midilinae labial palpi



Linostinae labial palpi



Musotiminae labial palpi



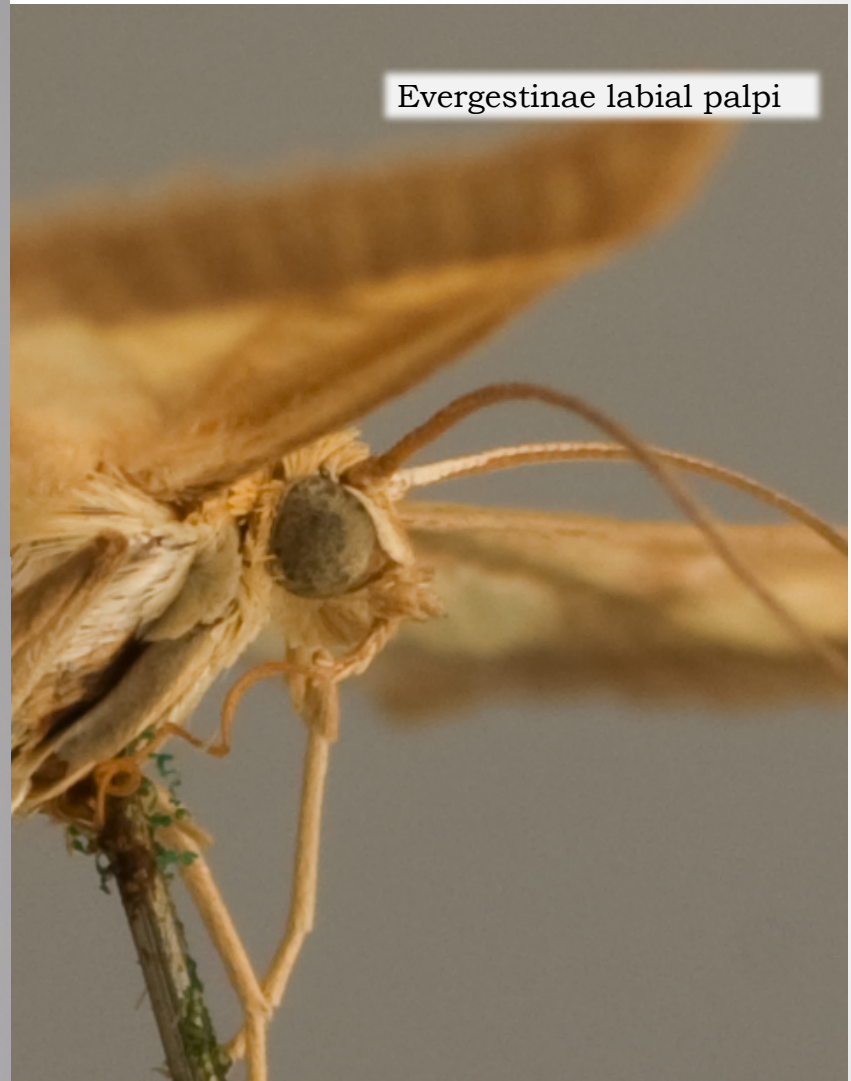
# Evergestinae



*Evergestis rimosalis*



*Evergestis rimosalis*



Evergestinae labial palpi

# Odontiinae





# Glaphyriinae

Glaphyriinae labial palpi



*Glaphyria sesquialis*



*Dicymolomia julianalis*



*Lipocosma adelalis*

# Schoenobiinae





# Schoenobiinae

- Brown or white without fasciae, often with longitudinal streaks.
- Semi-aquatic. Larvae boring in stems of marsh grasses and sedges
- *Donacaula*, *Rupela*, *Leptosteges*



# Scopariinae

*Scoparia biplagiata*



*Eudonia heterosalis*



Scopariinae labial palpi





# Scopariinae

- Small with distinctive forewing pattern.
- Larvae in roots/stems of mosses, ferns and vascular plants.
- Eugene Munroe - MONA
- *Scoparia*, *Eudonia*



# Crambinae

*Chrysoteuchia topiaria*



*Neodactria luteolellus*



*Vaxi critica*



Crambinae labial palpi

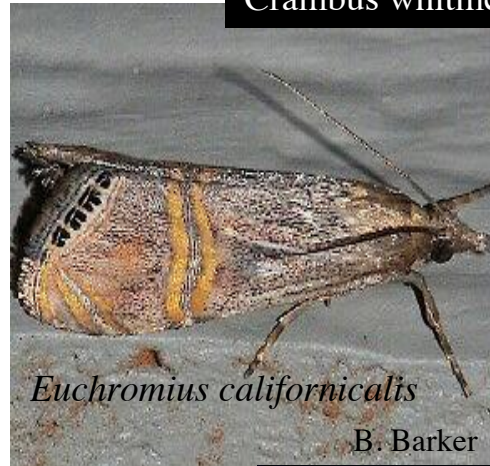


# Crambinae

- 2nd largest subfamily
- Larvae primarily on roots or stems of grasses and sedges.
- Many pest species
- Many species with shiny white scales or longitudinal pattern.
- *Crambus*, *Euchromius*, *Argyria*, *Diatraea*



*Crambus whitmerellus*



*Euchromius californicalis*

B. Barker



*Argyria nummulalis*

E. Martinez



*Diatraea rufidolus*

J. Vargo

# Acentropinae

*Petrophila bifascialis*



*Petrophila fulicalis*



Acentropinae labial palpi

*Parapoinx obscuralis*



*Synclita oblitalis*





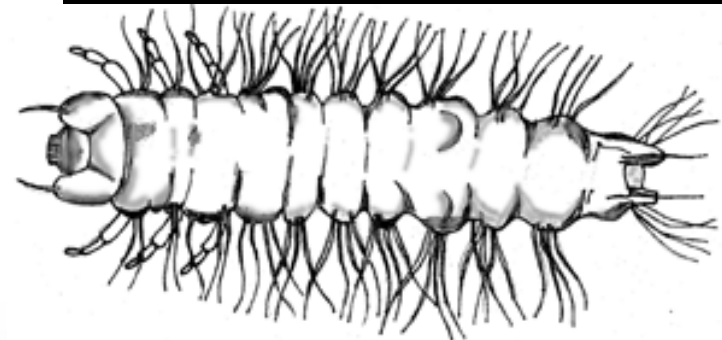
# Acentropinae

- Aquatic habitats
- One group in lotic habitats, larvae with gills, e.g., *Petrophila*.
- One group in lentic habitats, larvae lacking gills, e.g., *Elophila*.
- Eugene Munroe - MONA

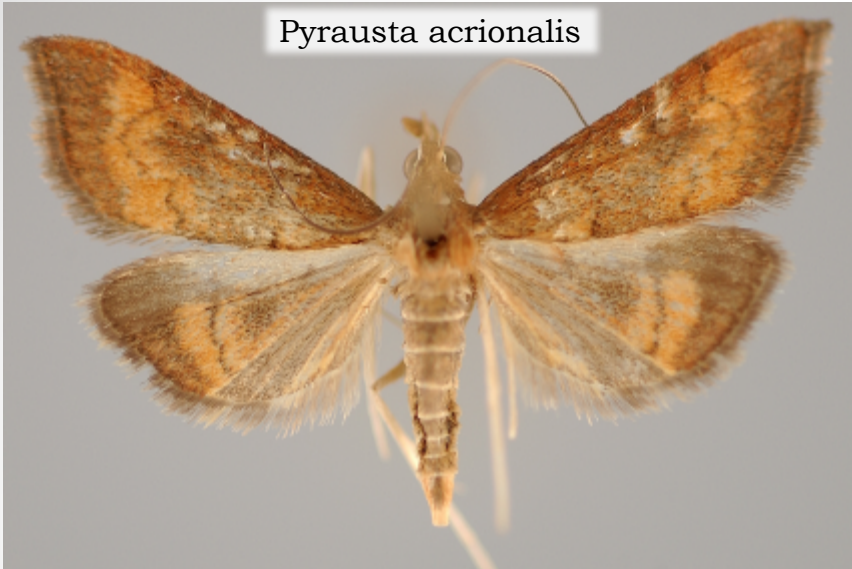


*Elophila gyralis*

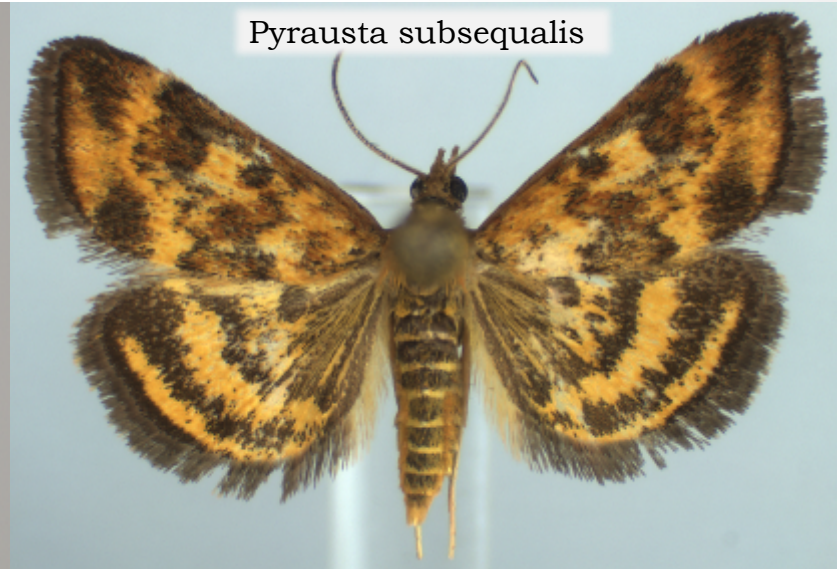
M. Drelling



# Pyraustinae



*Pyrausta acronalis*



*Pyrausta subsequalis*



Pyraustinae labial palpi



*Pyrausta laticlavia*



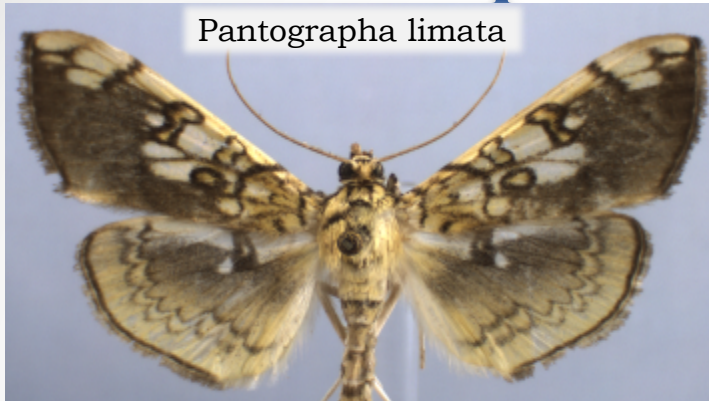
# Pyraustinae

- Third largest subfamily
- Many pest species
- Some species with colorful wings, especially with red and yellow.
- Eugene Monroe - MONA

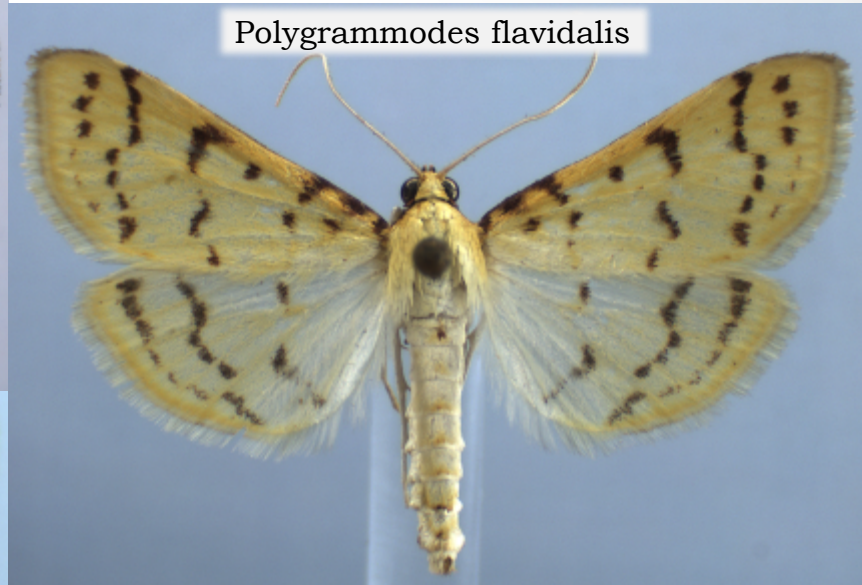


J. Vargo

# Spilomelinae



*Pantographa limata*



*Polygrammodes flavidalis*



*Udea rubigalis*



*Nomophila nearctica*



Spilomelinae labial palpi



# Spilomelinae

- Largest subfamily
- Formerly in Pyraustinae
- Many agricultural pests
- *Desmia*,  
*Herpetogramma*,  
*Palpita*, *Diaphania*.



## Final Exam -

Which are Pyralidae and which are Crambidae?





# Pyralidae



*Cacozelia basiochrealis*



*Phyciodes mucidella*



*Acrobasis tricolorella*



*Dioryctria rossi*

Photos by Jim Vargo

# Crambidae



*Diathrausta harlequinialis*



*Crambus whitmerellus*



*Mojavia achemonalis*



*Petrophila jaliscalis*

Photos by Jim Vargo



# References

- Fauske, G. M. [2013]. Moth Identification.  
*in Moths of North Dakota: an online identification guide.* <http://www.ndsu.nodak.edu/ndsu/ndmoths>
- Goldstein PZ, Metz MA, Solis MA (2013) Phylogenetic systematics of *Schacontia* Dyar with descriptions of eight new species (Lepidoptera, Crambidae). ZooKeys 291: 27–81. doi: 10.3897/zookeys.291.3744
- Nuss, M., B. Landry, F. Vegliante, A. Tränkner, R. Mally, J. Hayden, A. Segerer, H. Li, R. Schouten, M. A. Solis, T. Trofimova, J. De Prins & W. Speidel 2003–2013: Global Information System on Pyraloidea. - [www.pyraloidea.org](http://www.pyraloidea.org)
- REGIER, J. C., MITTER, C., SOLIS, M. A., HAYDEN, J. E., LANDRY, B., NUSS, M., SIMONSEN, T. J., YEN, S.-H., ZWICK, A. and CUMMINGS, M. P. (2012), A molecular phylogeny for the pyraloid moths (Lepidoptera: Pyraloidea) and its implications for higher-level classification. Systematic Entomology, 37: 635–656. doi: 10.1111/j.1365-3113.2012.00641.x
- Sharma, H.C. 1998. *Bionomics, host plant resistance, and management of the legume pod borer, Maruca vitrata – a review.* Crop. Prot. 17: 373–386.
- Solis, M. Alma (2007) Phylogenetic studies and modern classification of the Pyraloidea (Lepidoptera). Rev. Colomb. Entomol. 33(1): ([read online](#))
- Yehuda, S. B.; Wysoki, M.; Rosen, D., 1991: Phenology of the honeydew moth, *Cryptoblabes gnidiella* Milliere (Lepidoptera: Pyralidae), on avocado in Israel. Israel Journal of Entomology 1992; 25-26: 149-160
- [www.bugguide.net](http://www.bugguide.net)
- Moth Photographers Group: <http://mothphotographersgroup.msstate.edu/MainMenu.shtml>



*Arta olivalis* (Chrysauginae) Scott Justis